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EG&G - ROCKY FLATS PLANT
ENVIRONMENTAL MANAGEMENT

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**ROCKY FLATS PLANT
EMD OPERATING
PROCEDURES MANUAL**

**Manual No.: 5-21000-OPS-FO
Procedure No.: Table of Contents, Rev 13
Page: 1 of 2
Effective Date: 05/12/92
Organization: Environmental Management**

THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES:

**VOLUME I: FIELD OPERATIONS (FO)
VOLUME II: GROUNDWATER (GW)
VOLUME III: GEOTECHNICAL (GT)
VOLUME IV: SURFACE WATER (SW)
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ADMIN RECORD

A-SW-001031

REVIEWED FOR CLASSIFICATION/UCI

By

Date

[Signature]
May 18, 1992
[Signature] 5/18/92 (JUN)

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This is a RED Stamp ENVIRONMENTAL SAMPLE RADIOACTIVITY CONTENT SCREENING

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Category 2

TITLE:
ENVIRONMENTAL SAMPLE
RADIOACTIVITY CONTENT
SCREENING

Approved By:

[Signature]
(Name of Approver)

MAY 12 1992

(Date)

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REVIEWED FOR CLASSIFICATION/UCNI

By *[Signature]*
Date *March 1, 1992*

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2.0 PURPOSE

This procedure is intended to ensure that the samples collected as part of the Environmental Management (EM) Division activities are handled, transferred, and shipped in a manner consistent with their actual or projected radioactivity content/concentration. This procedure addresses:

- Applicable regulations/requirements
- Contractual agreements, and
- EG&G Rocky Flats Plant (RFP) policies, procedures, and requirements.

Proper radioactive content screening for shipment/transfer of samples to the appropriate laboratory is outlined. The procedure also addresses restrictions on the selection of the laboratory for screening and sample analysis based on the criteria for shipping and the limitations of the laboratory (e.g. license restrictions). The screening process is summarized in the flow diagram in Figure FO.18-1.

3.0 SCOPE

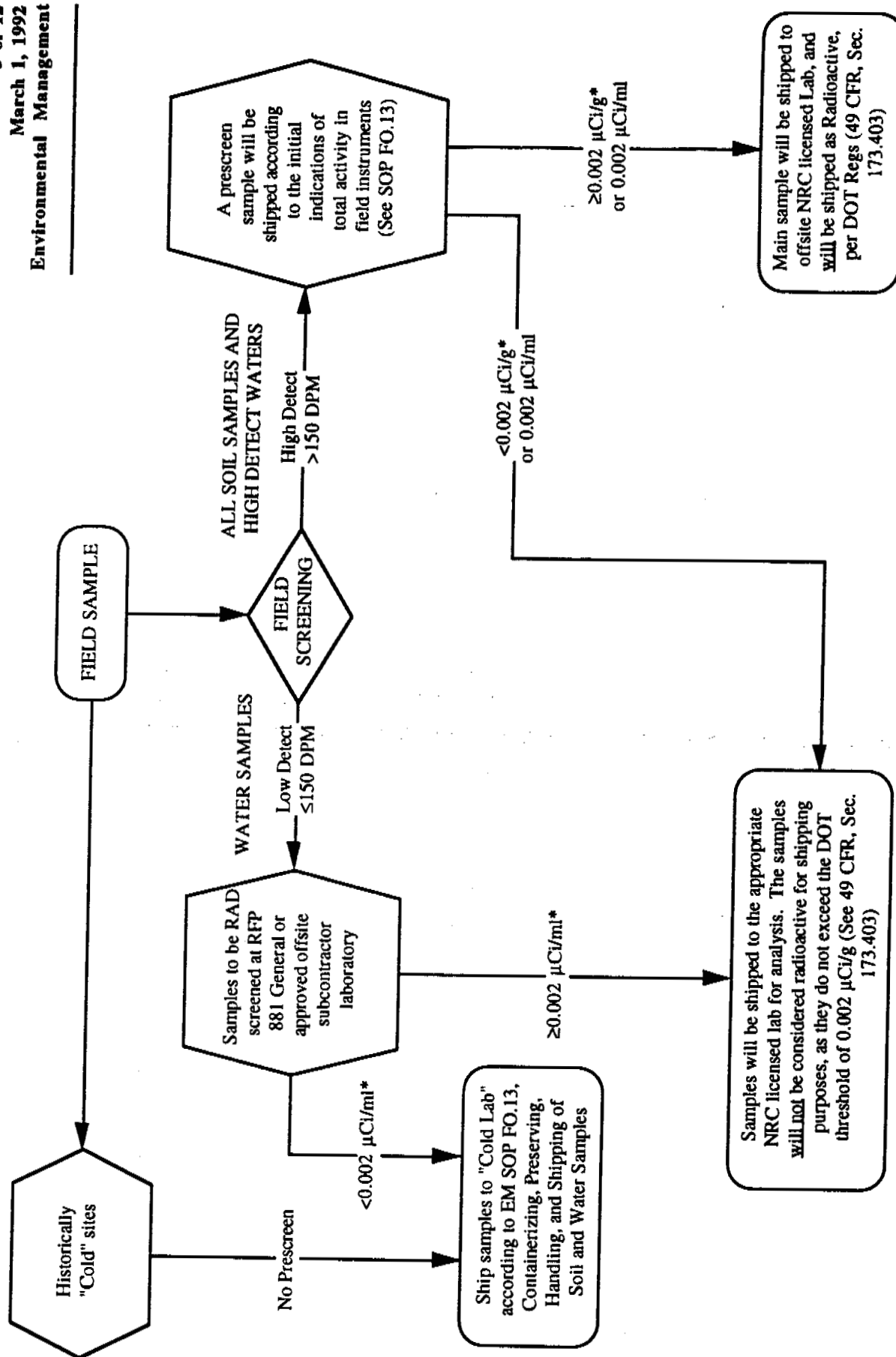
This procedure will be used by qualified subcontractor and EG&G personnel to select laboratories for screening and analysis of samples collected during EM activities. The procedure includes input for the selection of packaging and documentation for shipment, as related to radioactive material.

4.0 REFERENCES

4.1 SOURCE REFERENCES

DOE Order 5400.6, "Radiation Protection of the Public and the Environment."

FIGURE FO.18-1
SCHEMATIC OF RADIATION PRESCREENING



* Total alpha/beta activity

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DOE Order 5490.11, "Radiation Protection of Occupational Workers."

10 CFR 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material" (or equivalent agreement State requirements).

10 CFR 40, "Domestic Licensing of Source Material" (or equivalent agreement State requirements).

10 CFR 70, "Domestic Licensing of Special Nuclear Material" (or equivalent State requirements).

49 CFR, "Transportation," Subpart I-Radioactive Materials, Sections 173.401 to 173.478.

EG&G Rocky Flats Plant "Site-Wide Quality Assurance Project Plan for CERCLA Remedial Investigations/Feasibility Studies and RCRA Facility Investigations/Corrective Measures Studies Activities."

EG&G Rocky Flats Plant Transportation Manual, Traffic Department.

EG&G Rocky Flats Plant Health & Safety Procedures Manual.

4.2 INTERNAL REFERENCES

A related SOP cross-referenced in this procedure is:

- FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples.

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5.0 PREREQUISITES

Determine the projected upper limit activity for sample locations, based on historical data for the locations. Areas for which no historical data are available must be screened according to this procedure.

Identify the potential analytical laboratories for aliquot screening and sample analysis based on direction from EG&G Radioanalytical Program Chemist. Arrange for the completion of the aliquot screen and sample shipment to appropriate laboratory.

If sampling involves entry into radiological areas or sampling of potentially contaminated materials, follow the Health and Safety procedures for entry and/or sampling in these areas. Radiological Engineering-approved subcontractor Health and Safety Specialists support is required for sampling on RFP. Arrange for Radiological Engineering-approved subcontractor Health and Safety Specialists support, as needed, based on the planned sampling locations.

6.0 LIMITATIONS AND PRECAUTIONS

Samples with total activity $\geq 0.002 \mu\text{Ci/g}$ must be shipped "Radioactive" and in compliance with the applicable EG&G RFP requirements listed in the EG&G RFP Transportation Manual and the Plant Health and Safety Procedures Manual.

Environmental samples are considered non-radioactive unless historical data or sample screening indicates a total activity greater than $0.002 \mu\text{Ci/g}$.

When entering a radiological area, follow all applicable Health and Safety postings, practices, procedures, and instructions. This includes considerations to assure that all radiation exposures (internal and external) are "as low as reasonably achievable" (ALARA).

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When implementing the activities in this procedure assure that the chain-of-custody (COC) of the samples is maintained (see RFP Health and Safety Procedures Manual and SOP FO.13, Containerizing, Preserving, Handling, and Shipping of Soil and Water Samples).

7.0 PROCEDURE

7.1 SUMMARY

Radiological screening and classification of samples is performed to determine which samples may be analyzed by non-licensed laboratories, establish radiation work requirements, and to evaluate sample activity in terms of license and shipping limits.

7.2 ANALYSIS/OPERATION

7.2.1 Selection of Samples for Screening

Sample screening will be performed on the following types of samples from the RFP facility:

- Samples to be shipped to nonlicensed laboratories, unless an exception is made as stated below.
- Materials that are classified as waste. These materials are usually contained in drums, tanks, or ponds. A wide variety of matrices are encountered including liquids (often multi-phased), sludges, and heterogeneous solids.
- Samples of materials from process streams where radioactive materials are utilized.

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- Environmental samples from within the controlled areas of the RFP facility. These samples include soil, sludges, sediments, and water. Controlled areas are defined as areas where there is a reasonable risk for exposure to radiological health hazards.

Sample screening is not required for the following types of samples from the RFP facility:

- Filters, charcoal tubes, impinger solution, etc. from samples collected to measure ambient or breathing zone concentrations of airborne contaminants.
- Bioassay samples.
- Samples of plant or animal life (biota).
- Environmental samples including soil, sediments, and water from the environs outside RFP's controlled areas.
- Drinking water samples.

Samples shall be collected, shipped, stored, identified, and documented in an ordered sequence as shown in the Radiation Screening Schematic, Figure FO.18-1. A sample suite is collected in the field that includes a sample designated for radiation screening (RAD screen) when no historical data is available for a specific site.

The RAD screen is packaged and shipped to a licensed laboratory that is aware of the potential for radioactivity. The remainder of the sample suite is appropriately stored, pending the RAD screen analysis and categorization. COC procedures are observed for analytical activities.

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Samples shall undergo field screening and shall be segregated as: low detect (≤ 150 DPM) or high detect (> 150 DPM) as shown in Figure FO.18-1.

Water samples with ≤ 150 DPM will be screened by the 881 General Lab per the L-6114 Procedure for Gross Alpha/Beta by an approved offsite subcontractor.

For water samples with activity > 150 DPM and for all soil/sediment samples, an aliquot shall be shipped to an appropriately licensed laboratory for screening.

As indicated in Figure FO.18-2, Classification of Samples, if the screen results in: a total activity value of less than $0.002 \mu\text{Ci/g}$ and a gross alpha activity of $< 0.01 \mu\text{Ci/sample}$ and gross beta activity of $< 0.1 \mu\text{Ci/sample}$, the sample may be shipped to an unlicensed laboratory for analysis. These samples shall be designated as Category I type. Category I samples are nonradioactive as defined by DOT. Categories are based on activity per sample container. DOT shipping classifications are based on activity per package.

Category II samples may be nonradioactive, Limited Quantity, or Type A. Category II samples which are nonradioactive shall be shipped in the same manner as Category I samples. However, nonradioactive Category II samples MUST be shipped to a licensed laboratory. Limited Quantity and Type A samples must be shipped following specifications set forth in 49 CFR 173.421 and 173.421-1 and the appropriate Plant policies.

If the screen results in: a total activity of $< 0.01 \mu\text{Ci/g}$ and a gross alpha activity ≥ 0.01 but $< 0.1 \mu\text{Ci/sample}$ and a gross beta activity of ≥ 0.1 but $< 1 \mu\text{Ci/sample}$, the sample shall be shipped to an appropriately licensed laboratory. These samples are designated as Category II type. If the sample is Limited Quantity, the outside of the container shall be marked "RADIOACTIVE" and appropriately shipped to a licensed laboratory per the instructions in 10 CFR 40, Domestic Licensing of Source Materials and the RFP Site-Wide QAPjP. (See Figure FO.18-2.)

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Upon completion of the RAD screen at the designated laboratory, results are documented for transmittal to the sample coordinator. Results shall be sent by facsimile to the appropriate sampling coordinator. Results shall include the Sample Screening Release Form, Form FO.18A (see Section 8.0, Documentation) and the computer generated Form FO.18B, Sample Screening Form. These forms, along with any calculations performed by the sample coordinator, shall be retained by the subcontractor as QA documents.

The laboratory staff member with responsibility for reporting transmits the RAD screen results to the sample coordinator. The sample coordinator receives a facsimile of the results. Each subcontractor shall maintain a dedicated FAX for the purpose of receiving RAD screen results during the hours of 4:30pm to 6:00pm Mountain Time.

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FIGURE FO.18-2
CLASSIFICATION OF SAMPLES*

CATEGORY I
gross alpha <0.01 $\mu\text{Ci}/\text{sample}$ gross beta <0.1 $\mu\text{Ci}/\text{sample}$ total activity <0.002 $\mu\text{Ci}/\text{gram}$

CATEGORY II Limits per Sample
<0.1 mR/hr Contact
<0.01 $\mu\text{Ci}/\text{g}$ Total Activity
Gross Alpha** ≥ 0.01 but <0.1 $\mu\text{Ci}/\text{sample}$ Gross Beta** ≥ 0.1 but <1 $\mu\text{Ci}/\text{sample}$
Follow safe lab practices for handling radioactive materials

- Sample classification is determined by comparing sample screening results to category limits. If screening results exceed any of the limits for a given category, the results should then be compared to the limits of the next higher category.

- ** If the radiological contaminants in the sample are known to be only U-natural, U-238, Th-natural, Th-232, (or their daughters) or H-3, the classification should be based on 10 times the limits given above. For example, Category III limits for U-238 would correspond to a gross alpha activity of 1 μCi or a gross beta activity of 10 μCi .

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The shipping clerk documents the shipping destination of the samples on the Sample Screening Release Form, Form FO.18A (see Section 8.0, Documentation).

The sampling coordinator will provide the screening results to the shipping clerk.

These samples are not considered radioactive for shipping purposes if they do not exceed the DOT threshold of 0.002 $\mu\text{Ci/g}$ (See EG&G RFP Transportation Manual).

Irrespective of the requirements listed above, the respective Laboratory Radiation Officer has the final authority to determine which samples will be screened prior to shipment to that lab.

7.2.2 Selection of Approved Screening Methods

The sample screening method selected shall be appropriate for the types of radiological contaminants present in the sample.

The analytical detection limit for the screening method selected shall be adequate to detect gross alpha activity of 0.01 $\mu\text{Ci/sample}$ and gross beta activity of 0.1 $\mu\text{Ci/sample}$ when the concentration is multiplied by the sample volume (or mass).

An example of an approved screening method for Waters/liquids/soils is:

- A homogenized sample aliquot (approximately 4 mls for liquids and 1 gram for soils) is placed on a tared planchet and dried under a heat lamp. The aliquot is brought to a constant weight at room temperature and counted for gross alpha/beta activity with a gas flow proportional counter.

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Laboratories performing screening will be required to submit for approval to the Radioanalytical Program Chemist SOPs which encompass the following:

- Radiological Screening and Classification of Samples
- Calibration and Operation of Gas Flow Proportional Counters
- Calibration and Operation of a Germanium Gamma Spectrometer.

Additional methods may be used but must be adequately documented in standard operating procedures and shall specify the method detection limits.

Screening data shall be transmitted to the receiving laboratory in the following format:

- Sample identification;
- Total specific activity of the sample in units of $\mu\text{Ci/g}$;
- Gross alpha/beta activity in units of μCi ;
- Isotopic analysis in units of μCi may be substituted for gross alpha/beta activity if all sample radioactivity is accounted for by this method.

7.2.3 Classification of Samples

Samples shall be classified based upon the total alpha/beta activity of the sample, the specific activity, and for Category II samples, the preceding plus the contact exposure rate. Determination of DOT Radiological Shipping classification for sample shipping may be determined by utilizing the following examples:

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Example I.

Sample #BH0001WC

Matrix: Soil

Sample Size: 500 grams

Specific Alpha Activity (SA) = $1.72\text{E-}4$ uCi/g

Specific Beta Activity (SB) = $4.65\text{E-}4$ uCi/g

Screening Classification:

Gross alpha activity (uCi) = SA (uCi/g) x Sample Size (g)

Gross alpha = $1.72\text{E-}4$ uCi/g x 500g

Gross alpha = 0.09 uCi

Gross beta activity (uCi) = SB (uCi/g) x Sample Size (g)

Gross beta = $4.65\text{E-}4$ uCi/g x 500g

Gross beta = 0.23 uCi

Total Specific Activity = SA + SB = $1.72\text{E-}4$ uCi/g + $4.65\text{E-}4$ uCi/g
= $6.37\text{E-}4$ uCi/g

Gross alpha > 0.01uCi

Gross beta > 0.1uCi

Total Specific Activity > 0.002 uCi/g,

therefore Category II and SHIP TO LICENSED LABORATORY

DOT SHIPPING CLASSIFICATION:

Specific Activity < 0.002 uCi/g, therefore DOT NON-RADIOACTIVE

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Example II.

Sample #TR00001IT

Matrix: Soil

Sample Size: 500 grams

Specific activity alpha (SA) = $7.78\text{E-}5$ uCi/g

Specific activity beta (SB) = $1.12\text{E-}4$ uCi/g

Screening Classification:

Gross alpha activity (uCi) = SA (uCi/g) x Sample Size (g)

Gross alpha = $7.78\text{E-}5$ uCi/g x 500 grams

Gross alpha = $3.89\text{E-}2$ uCi

Gross beta activity (uCi) = SB (uCi/g) x Sample Size (g)

Gross beta = $1.12\text{E-}4$ uCi/g x 500 grams

Gross beta = $5.6\text{E-}2$ uCi

Total Specific Activity - SA + SB

Total specific activity = $7.78\text{E-}5$ uCi/g + $1.12\text{E-}4$ uCi/g

Total specific activity = $1.90\text{E-}4$ uCi/g

GROSS ALPHA > 0.01 uCi BUT < 0.1 uCi (0.0389 uCi)

Gross beta < 0.1 uCi

Total Specific Activity < 0.002 uCi/g therefore CATEGORY II SAMPLE

DOT SHIPPING CLASSIFICATION:

Specific Activity < 0.002 uCi/g therefore DOT NON-RADIOACTIVE

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Samples classified as $<0.002 \mu\text{Ci}$ (Category I) are considered exempt from licensing requirements and may be transferred to non-licensed laboratories. These samples are of sufficiently low activity to require no special handling procedures.

Samples classified as $>0.002 \mu\text{Ci}$ (Category II) shall be sent to licensed facilities. Both Category I and Category II samples may be non-radioactive and are exempt from DOT.

Extracts of samples shall be given the classification of the original sample. The laboratory radiation safety officer may elect to reclassify the extract based on additional measurements or on knowledge of the extraction procedure.

Samples shall not be released for analysis until properly classified.

8.0 DOCUMENTATION

The signature on Form FO.18A, Sample Screening Release Form and on Form FO18B, Radioactive Analysis Report, verifies and authenticates the completion of this procedure and the accuracy of the data/information recorded.

SAMPLE SCREENING RELEASE FORM*

Matrix _____

COC# _____

SDG# _____

Batch# _____

Client ID	Lab #	Total Activity in μCi		
		Alpha	Beta	Other**

Below Category I Release Limits _____ yes _____ no

If no, specify the samples above Category I
_____Precautions: _____

Approval for Release _____ Date _____

* Form FO18B, Sample Screening Form (computer generated), must accompany this form.

** Other analysis may include Tritium, etc.

